AMENDMENTS TO THE CLAIMS

1. (Original) An optical element, comprising:

a single-polarized ferroelectric substrate;

a plurality of domain inversion regions formed in the ferroelectric substrate; and

a groove formed on the surface of the ferroelectric substrate between the domain inversion regions,

wherein the depth T' of at least one of the domain inversion regions satisfies the relation T' < T with respect to the substrate thickness T.

2. (Original) The optical element according to claim 1, wherein

the domain inversion region that satisfies the relation T' < T accounts for at least 50% of all of the plurality of domain inversion regions.

3. (Original) The optical element according to claim 1, wherein

the domain inversion region that satisfies the relation T' < T accounts for at least 90% of all of the plurality of domain inversion regions.

4. (Original) The optical element according to claim 1, wherein

the spacing of the domain inversion regions is 5 μm or less.

5. (Original) The optical element according to claim 1, wherein

the width of the domain inversion regions is 5 μm or less.

6. (Original) The optical element according to claim 1, wherein

the thickness of the ferroelectric substrate is at least 0.5 mm.

7. (Original) The optical element according to claim 1, wherein

the ferroelectric substrate is a single-polarized crystal,

the domain inversion region has a distal end component in the interior of the surface of the ferroelectric substrate, and

the direction of the distal end component is the Y axis direction of the crystal.

8. (Original) The optical element according to claim 1, wherein

the groove is formed at a depth of at least 0.5 μm from the surface of the ferroelectric substrate.

9. (Original) The optical element according to claim 7, wherein

the groove is formed at a depth of 10 μm or less from the surface of the ferroelectric substrate.

10. (Currently Amended) The optical element according to ~~any of claims~~ claim 1 ~~to 9~~, wherein

the domain inversion regions have periodic domain inversion structures.

11. (Original) The optical element according to claim 10, wherein

the angle formed by the normal line of the ferroelectric substrate and the spontaneous polarization of the ferroelectric substrate is no more than 30°, and

the Y axis of the crystal is at a right angle to the period direction of the domain inversion regions.

12. (Original) The optical element according to claim 10, wherein

the angle formed by the normal line of the ferroelectric substrate and the spontaneous polarization of the ferroelectric substrate is no more than 30°,

the thickness T of the ferroelectric substrate is greater than or equal to 0.5 mm, and

the period Λ of the domain inversion regions is less than or equal to 2 μm.

13. (Currently Amended) The optical element according to ~~any of claims~~ claim 1 ~~to 12~~, wherein

the ferroelectric substrate is magnesium-doped $LiTa_{(1-x)}Nb_xO_3$ ($0 \leq x \leq 1$).

14. (Original) A method for forming domain inversion regions in the interior of a single-polarized ferroelectric crystal substrate, comprising the steps of:

providing a groove to the surface of the ferroelectric substrate and dividing the surface of the ferroelectric substrate into a plurality of regions; and

applying an electric field to the plurality of regions and forming domain inversion regions,

wherein the direction of the electric field is a direction facing the spontaneous polarization of the ferroelectric substrate, and

in the step of applying the electric field, a potential difference is produced in the plurality of regions.

15. (Original) The method for forming domain inversion regions according to claim 14, wherein

the depth T' of at least one of the domain inversion regions satisfies the relation $T' < T$ with respect to the substrate thickness T.

16. (Original) The method for forming domain inversion regions according to claim 14, wherein

the plurality of regions are formed so as to be periodically adjacent, and

in the step of applying the electric field, mutually different potentials are produced in the regions adjacent at a specific period.

17. (Original) The method for forming domain inversion regions according to claim 14, wherein

in the step of applying the electric field, a different electric field is applied to each of the plurality of regions.

18. (Original) The method for forming domain inversion regions according to claim 14, wherein

in the step of applying the electric field, an electric field that changes with time is applied to any of the plurality of regions.

19. (Original) The method for forming domain inversion regions according to claim 18, wherein

in the step of applying the electric field, the change in the electric field is at least 1 kV/second.

20. (Original) The method for forming domain inversion regions according to claim 14, wherein

the width of the groove is 5 μm or less.

21. (Original) The method for forming domain inversion regions according to claim 14, wherein

the width of each of the plurality of regions is 5 μm or less.

22. (Original) The method for forming domain inversion regions according to claim 14, wherein

the thickness of the ferroelectric substrate is at least 0.5 mm.

23. (Original) The method for forming domain inversion regions according to claim 14, wherein

in the step of applying the electric field, a positive field and a negative field are applied alternately.

24. (Original) The method for forming domain inversion regions according to claim 14, wherein

in the step of applying the electric field, the electric field is a pulsed electric field having a pulse width of 10 msec or less.

25. (Original) The method for forming domain inversion regions according to claim 14, wherein

the groove is formed at a depth of at least 0.5 μm from the surface of the ferroelectric substrate.

26. (Original) The method for forming domain inversion regions according to claim 25, wherein

the groove is formed at a depth of 10 μm or less from the surface of the ferroelectric substrate.

27. (Original) The method for forming domain inversion regions according to claim 14, wherein

the plurality of regions are formed so as to be disposed alternately at a specific period, and

the domain inversion regions are formed at the specific period.

28. (Original) The method for forming domain inversion regions according to claim 14, wherein

the plurality of regions each have a sub-region group composed of a plurality of sub-regions disposed at predetermined intervals,

the plurality of regions are formed so that the sub-region groups are disposed alternately, and

the domain inversion regions are formed at the predetermined intervals.

29. (Original) The method for forming domain inversion regions according to claim 14, wherein

the ferroelectric substrate is magnesium-doped $LiTa_{(1-x)}Nb_xO_3$ ($0 \leq x \leq 1$).

30. (Original) The method for forming domain inversion regions according to claim 14, wherein

the ferroelectric substrate is a substrate composed of X-cut, Y-cut, or Z-cut.

31. (Original) The method for forming domain inversion regions according to claim 14, wherein

the angle formed by the normal line of the ferroelectric substrate and the spontaneous polarization of the ferroelectric substrate is no more than 30°,

the domain inversion regions are formed periodically, and

the Y axis of the ferroelectric substrate is at a right angle to the period direction of the domain inversion regions.

32. (Original) The method for forming domain inversion regions according to claim 14, wherein

the thickness T of the ferroelectric substrate is greater than or equal to 0.5 mm, and

the period Λ of the domain inversion region is less than or equal to 2 μm.

33. (Original) The method for forming domain inversion regions according to claim 14, wherein

in the step of applying the electric field, an electric charge of at least 100 times of 2PsA, where Ps is the spontaneous polarization and A is the domain inversion surface area, is applied.

34. (Original) The method for forming domain inversion regions according to claim 14, wherein

the step of applying the electric field is performed in an insulating solution of at least 80°C.